



## **NGA Center for Best Practices: Federal Facilities Task Force Ensuring Clarity and Transparency in Radioactive Waste Definitions**

The purpose of this document is to help states impacted by cleanup at U.S. Department of Energy (DOE) nuclear weapons cleanup sites clarify the radioactive waste classifications that underpin cleanup activities and ensure consistent use of terminology among the Federal Facilities Task Force (FFTF), DOE and other organizations as cleanup proceeds.

### **Introduction and Background**

Following the Manhattan Project, the end of World War II, and a series of actions reorganizing the regulation of energy and defense activities, policymakers designated DOE as responsible for nuclear waste, nuclear weapons production and nuclear reactor research.

States play an important role in the cleanup partnership, regulating and/or overseeing the cleanup effort and working with DOE to ensure that federal and state laws are followed and that cleanup decisions are transparent, responsible and equitable. States have authority to regulate DOE's mixed hazardous wastes in accordance with the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) under the authority granted by the Federal Facilities Compliance Act. As such, states approve and regulate implementation of DOE's Site Treatment Plans for the treatment, storage and/or disposal of DOE's mixed low-level waste to protect human health and the environment. DOE self-regulates low-level waste (LLW) under the Atomic Energy Act (AEA).

### **Radioactive Waste Definitions**

Cleanup of weapons production sites across the U.S. is the mission of the DOE Office of Environmental Management (DOE-EM) and is governed by a common set of legal definitions of radioactive waste, as defined by Congress in the Nuclear Waste Policy Act (NWPA) and incorporated by reference into the Atomic Energy Act (AEA). DOE Order 435.1 describes how DOE typically manages different streams of radioactive waste, including low-level waste (LLW), Mixed LLW, transuranic waste (TRU) and high-level waste (HLW). As Table 1 illustrates, the nuclear waste types that DOE (defense) and NRC (commercial) manage and regulate overlap in varying degrees with respect to regulatory responsibility.

**NGA Center for Best Practices: Federal Facilities Task Force**  
**Ensuring Clarity and Transparency in Radioactive Waste Definitions**

*Table 1: Agency, Waste Type, Definitions/Description, Regulatory Responsibilities and Disposal Pathways*

Department of Energy (DOE) Waste			
Waste Type	Definition/Description	Regulatory Responsibilities	Disposal Pathway
Low-Level waste (LLW) <ul style="list-style-type: none"> <li>• Mixed</li> <li>• Not mixed</li> </ul>	LLW is not high-level radioactive waste, SNF, TRU waste, byproduct material or naturally occurring radioactive material. Most LLW contains small amounts of radioactivity in large volumes of material. Some LLW, however, can contain significant levels of radioactivity. <sup>1</sup>	<ul style="list-style-type: none"> <li>• DOE</li> <li>• EPA/State permit if mixed</li> <li>• NRC/Agreement State</li> </ul>	DOE on-site or offsite disposal or licensed commercial disposal facility
Transuranic (TRU) waste <ul style="list-style-type: none"> <li>• Mixed</li> <li>• Not mixed</li> </ul>	Waste that contains more than 100 nanocuries of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years. TRU waste is generated primarily during the research, development and production of nuclear weapons. Most of the waste consists of items such as laboratory clothing, tools, glove boxes, rubber gloves and air filters contaminated with small amounts of plutonium and other radioactive elements. <sup>2</sup> Mixed transuranic waste (MTRU) meets the definitions of both transuranic and hazardous waste.	<ul style="list-style-type: none"> <li>• DOE</li> <li>• EPA certification</li> <li>• New Mexico Hazardous Permit</li> <li>• EPA/State Permit for mixed storage</li> </ul>	Waste Isolation Pilot Plant (New Mexico) for defense generated waste
High-Level waste (HLW) <ul style="list-style-type: none"> <li>• Mixed</li> <li>• Not Mixed</li> </ul>	Radioactive waste resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from such liquid waste that contains fission products in sufficient concentrations. Other highly radioactive waste that the Commission, consistent with existing law, determines by rule requires permanent isolation. <sup>3 4</sup>	<ul style="list-style-type: none"> <li>• DOE</li> <li>• EPA disposal standards</li> <li>• State Permits if mixed for storage</li> <li>• NRC licenses</li> </ul>	<b>Disposal location not yet identified.</b> By statute, must be disposed in a deep geologic repository. DOE's Office of Nuclear Energy is considering one or more interim storage facilities that would allow the federal government to take possession of SNF until a permanent deep geologic repository is constructed.

**NGA Center for Best Practices: Federal Facilities Task Force  
Ensuring Clarity and Transparency in Radioactive Waste Definitions**

Commercial Waste			
Waste Type	Definition/Description	Regulatory Responsibilities	Disposal Pathway
Spent nuclear fuel (SNF)	Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by processing. <sup>5</sup>	<ul style="list-style-type: none"> <li>• U.S. EPA disposal standards</li> <li>• NRC licenses</li> </ul>	<b>Disposal location not yet identified.</b> By statute, must be disposed in a deep geologic repository. DOE's Office of Nuclear Energy is considering one or more interim storage facilities that would allow the federal government to take possession of SNF until a permanent deep geologic repository is constructed.
Class A Low-Level Waste (LLW)	Waste that contains the lowest concentration of radioactive isotopes, most of which have a half-life less than five years. <sup>6</sup>	<ul style="list-style-type: none"> <li>• Agreement State licenses - commercial facilities</li> <li>• NRC licenses for non-agreement states</li> </ul>	State compact system or licensed commercial disposal facility
Class B LLW	Contains the next-lowest concentration of radioactive isotopes, with a longer half-life. <sup>7</sup>		
Class C LLW	Contains the highest concentration of radioactive isotopes that can be legally buried in an LLW disposal facility. <sup>8</sup>		
Greater Than Class C (GTCC) LLW	Waste containing a concentration of radioactive isotopes that exceeds the limits for Class C waste specified in 10 C.F.R. Part 61.55. <sup>9</sup>	<ul style="list-style-type: none"> <li>• DOE for disposal</li> <li>• NRC/Agreement State regulates disposal</li> </ul>	<b>Not yet identified.</b> DOE has completed NEPA analysis of potential disposal alternatives and is awaiting action by Congress on the Department's 2017 Report to Congress prior to making a final decision on the disposal alternative or alternatives to implement.* NRC is currently developing a licensing rule which will promulgate requirements for the near-surface disposal of GTCC waste.

*\* In February 2016, DOE publicly issued the Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375) that evaluated five alternatives for the disposal of GTCC waste. In October 2018, DOE issued the Environmental Assessment (EA) for the Disposal of GTCC and GTCC-Like Waste at Waste Control Specialists (WCS), Andrews County, Texas. These documents and the Department's 2017 Report to Congress are available at: <https://www.energy.gov/em/waste-management/waste-and-materials-disposition-information/greater-class-c-low-level>.*

In addition to the waste types mentioned above, DOE Order 435.1 describes the process by which DOE evaluates whether certain HLW can be managed as non-HLW through a waste incidental to reprocessing (WIR) determination. DOE M 435.1 includes “WIR by Citation” and “WIR by Evaluation.” DOE uses WIR by citation regularly for slightly contaminated equipment, PPE etc. WIR by evaluation includes a detailed site-specific evaluation of the waste and disposal facility. The WIR Evaluation per DOE M 435.1 must show that reprocessing wastes that will be managed as low-level waste meet the following criteria:

1. Have been processed, or will be processed, to remove key radionuclides<sup>10</sup> to the maximum extent that is technically and economically practical;
2. Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C, Performance Objectives; and
3. Are to be managed, pursuant to DOE’s authority under the Atomic Energy Act of 1954, as amended, and in accordance with the provisions of Chapter IV of DOE M 435.1-1, provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55, Waste Classification; or will meet alternative requirements for waste classification and characterization as DOE may authorize. By default, any waste without a specified disposal pathway must be stabilized and temporarily stored on-site.

## **DOE Interpretation of HLW Definition**

The United States is unique among countries with radioactive waste in that it includes a definition based on its origin rather than by its radiological characteristics. The statutory definition for HLW is largely based on the source and method of production (such as high-level liquid waste from spent nuclear fuel reprocessing), certain technical criteria (including overall radioactivity levels) or some combination of those factors. Over the years of environmental cleanup at DOE EM sites, many groups have suggested reforms of the U.S. waste classification system and definitions to provide greater clarity in definitions of nuclear waste, including suggestions to move toward defining waste based on radiological characteristics. Such a change would require amendments to the AEA, the NWPA and other acts passed by Congress. In 2019, DOE issued a public notice on its intent to interpret risk-

### **Consent-Based Siting**

DOE’s Office of Nuclear Energy is currently undertaking a consent-based siting process to identify one or more interim storage facilities for commercial spent nuclear fuel. This process uses a community-based participatory approach to siting that will ideally provide lessons learned and best practices for siting a permanent deep geologic repository for the nation’s HLW. NRC’s authority to license interim storage facilities is the subject of ongoing litigation.

## NGA Center for Best Practices: Federal Facilities Task Force Ensuring Clarity and Transparency in Radioactive Waste Definitions

based aspects of the language of the statutory definition for HLW. The FFTF sent a letter to then DOE-EM Assistant Secretary Anne White in early 2019 reiterating the need for improved up-front communications with affected states regarding potential disposal pathways under the HLW interpretation. In 2020, DOE transported 8 gallons of liquid waste from the Savannah River Site to a commercial disposal facility in Texas for treatment and disposal with no issues reported by the sending or receiving states. As mentioned in the preceding section, DOE Order 435.1 provides the ability to determine that certain wastes resulting from reprocessing spent nuclear fuel can be managed as low-level waste (LLW) through the WIR process, rather than managed as HLW.

In 2021, DOE issued its interpretation of the statutory definition of HLW. DOE's interpretation of HLW is that reprocessing waste is non-HLW if the waste:

- Does not exceed concentration limits for Class C low-level radioactive waste as set out in Section 61.55 of 10 C.F.R. or
- Does not require disposal in a deep geologic repository and meets the performance objectives of a disposal facility as demonstrated through a performance assessment conducted in accordance with applicable regulatory requirements.

Under DOE's interpretation of the statutory definition, waste that meets either of these criteria is not HLW and can be classified and disposed of in accordance with its radiologic characteristics. In practice this interpretation has resulted in a decision by DOE that a limited amount of reprocessing waste from the Savannah River Site can be treated as LLW and disposed of in a commercial off-site facility.



## **Other Waste Terminology**

To maintain a clear, scientifically supported waste disposition process, it is important that DOE and states continue to use consistent terminology to define waste, with well-vetted processes where definitions need to evolve. The FFTF identified several instances where other terminology has been applied to nuclear waste streams. These instances, described below, should be subject to a robust vetting process with the states before adoption.

- **Greater-than-class-C “like” Waste**

Greater-than-class-C waste is an NRC classification that refers to waste generated by NRC licensees or Agreement State licensees that exceeds the concentration limits of radionuclides established for Class C waste. Under the Low-Level Radioactive Waste Policy Amendments Act of 1985, Greater-than-Class-C waste must be disposed of in a facility that is adequate to protect public health and safety and is licensed by the NRC. DOE also owns and generates both LLW and non-defense-generated TRU waste, which have characteristics *like* those of GTCC LLW. DOE refers to these wastes as “GTCC-like” wastes. The term “GTCC-like” originated from DOE’s Final Environmental Impact Statement for Disposal of GTCC Low-Level Radioactive Waste and GTCC-Like Waste.<sup>11</sup> As used in the EIS, “GTCC-like waste refers to radioactive waste that is owned or generated by DOE and has characteristics similar to those of GTCC low-level radioactive waste (LLW) such that a common disposal approach may be appropriate . . . The term is not intended to, and does not, create a new DOE classification of radioactive waste.” This point was echoed in a 2022 report from the U.S. Government Accountability Office: “GTCC-like is not a legal or regulatory concept, but a DOE term.”<sup>12</sup> As with GTCC waste, GTCC-like waste does not currently have a disposal pathway.”<sup>13</sup>

- **State-Specific Waste Terminology: Low-Activity Waste**

Low-Activity Waste (LAW) is a Hanford-specific term agreed to between NRC and DOE.<sup>14</sup> LAW is a mixed radioactive waste stream that has been separated from Hanford’s high-level tank waste subject to a WIR determination under DOE Order 435.1 and thus can be managed and disposed as low-level waste. This waste stream is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e.(2) of 42 USC 2011 et seq., Atomic Energy Act of 1954), or naturally occurring radioactive material (DOE 2004).



## **Waste Terminology Developments, States' Concerns, and Potential Actions**

State regulators have worked with DOE-EM for over three decades to implement Federal Facility Agreements and other legal agreements such as consent orders or settlements at nuclear weapons cleanup sites across the country. Throughout, states and DOE generally follow the waste classification framework described in Section 1, above. Waste classification carries implications for packaging, storing, transporting, treating, and disposal pathways.

States affirm the importance of process and engagement with DOE around waste terminology to ensure there is no misunderstanding or confusion as decisions are made. For example, at informational sessions for contractors on DOE's RFP for the Phase 1B Decommissioning work at the West Valley Demonstration Project, participants stated they were unfamiliar with the term "GTCC-like waste" and requested clarity on the requirements for managing or disposing of "GTCC-like" waste. Consequently, in subsequent presentations on this procurement, DOE used the legally correct term "TRU."

Another example is the WIPP Hazardous Waste Facility Permit, administered by the New Mexico Environment Department, which contains a new permit condition to define the term "legacy waste." DOE and its management and operating contractor at WIPP are drafting a Legacy TRU Waste Disposal Plan in consultation with generator/storage sites who send waste to WIPP and their stakeholders. Each of these DOE generator/storage sites defines the term "legacy waste" differently. If DOE establishes a universal definition for this term, this should be communicated to states.

As mentioned above, waste classifications impact across multiple areas including state-federal cleanup agreements, transportation considerations, treatment infrastructure and disposition pathways. States and DOE strive to work together to ensure interim storage and final disposal remains safe for nearby communities and aligns with agreed-upon milestones between the states and DOE. For example, in 2023 the FFTF met virtually with DOE staff to gain better understanding of DOE's Performance Assessment process and how DOE could better facilitate state participation. States' input into these types of processes will provide information to DOE on implications of changes to waste classification that should be considered before DOE makes changes to this critical component of the EM cleanup program.

States will continue to work with DOE to clean up the nuclear weapons complex in a manner protective of human health and the environment. As DOE and its contractors carry out the cleanup, states, through the FFTF and individually, look forward to continuing collaboration with DOE.

## **About the FFTF**

America's nuclear weapons complex, developed during World War II and expanded throughout the Cold War, created a significant environmental cleanup legacy that spanned 107 sites and 35 states and will require decades to complete. To provide ongoing technical assistance to states and facilitate coordination with the U.S. Department of Energy, the NGA Center for Best Practices established the Federal Facilities Task Force (FFTF) in 1993 to assist in the development of the initial Federal Facilities Compliance Act site treatment plans and continues to support FFTF states on related efforts. This network of Governors' designees from states hosting or affected by ongoing federal cleanup sites continues to play an active role ensuring safe, cost-effective, and thorough federal cleanup of defense nuclear waste through ongoing coordination with DOE, robust interstate collaboration, regular meetings, and engagement with other state, local, tribal, and federal groups.

The mission of the FFTF is to bring together Governor-designated representatives with U.S. Department of Energy (DOE) officials to examine critical technical, policy and budget issues and improve coordination of major program decisions on a range of issues related to radioactive material and waste, including:

- Transparency in the DOE decision-making process, particularly for waste treatment and disposal decisions.
- A safe transportation and disposal system for all types of radioactive waste.
- Sufficient funding for DOE to meet annual milestones in state-DOE compliance agreements.
- Long-term stewardship at sites where cleanup to unrestricted levels is not possible.

Governors of each participating state designate up to two representatives to serve on the FFTF. Appointments typically include one policy and one technical or regulatory representative, but these selections are at the discretion of each governor. Representatives usually come from one or more state agencies responsible for the oversight and regulation of hazardous waste, such as environmental protection, energy, or natural resources departments. The 13 states currently participating in the FFTF, are: [California](#), [Idaho](#), [Kentucky](#), [Missouri](#), [Nevada](#), [New Mexico](#), [New York](#), [Ohio](#), [Oregon](#), [South Carolina](#), [Tennessee](#), [Texas](#), and [Washington](#).

---

*This report was developed by Daniel Lauf, Program Director, Energy in the NGA Center for Best Practices with Andy Chinn and Tristan Márquez from Ross Strategic.*

*This report was completed with support from DOE EM under Award Number DE-EM0005173.*

*Disclaimer: This report was prepared as an account of work sponsored by an agency of the U.S. Government. Neither the U.S. Government, nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendations, favoring by the U.S. Government or an agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof*



## **Endnotes**

<sup>1</sup> [42 U.S.C. § 10101](#)(16). The NHPA defines “low-level radioactive waste” as follows:

[R]adioactive material that—

- (A) is not high-level radioactive waste, spent nuclear fuel, transuranic waste, or byproduct material as defined in section 2014(e)(2) of this title; and
- (B) the Commission, consistent with existing law, classifies as low-level radioactive waste.

<sup>2</sup> The West Valley Demonstration Project Act defines “high level radioactive waste” as follows:

[T]he high level radioactive waste which was produced by the reprocessing at the [Western New York Nuclear Service] Center of spent nuclear fuel. Such term includes both liquid wastes which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the Commission designates as high level radioactive waste for purposes of protecting the public health and safety.

West Valley Demonstration Project Act, [Pub L. No. 96-368](#)<sup>2</sup>

Nuclear Regulatory Commission rules define “high-level radioactive waste” as follows:

- (1) Irradiated reactor fuel,
- (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and
- (3) solids into which such liquid wastes have been converted.

[10 C.F.R. § 60.2](#). See also [10 CFR Part 50, Appendix F](#) ¶ 2 (“For the purpose of this statement of policy, ‘high-level liquid radioactive wastes’ means those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels”).

<sup>3</sup> [42 U.S.C. § 2014](#)(ee). The AEA defines “transuranic waste” as follows:

[M]aterial contaminated with elements that have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and that are in concentrations greater than 10 nanocuries per gram, or in such other concentrations as the Nuclear Regulatory Commission may prescribe to protect the public health and safety.

The WIPP Land Withdrawal Act defines “transuranic waste” as follows:

[W]aste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for—

- (A) high-level radioactive waste;
- (B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or
- (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations.

## NGA Center for Best Practices: Federal Facilities Task Force Ensuring Clarity and Transparency in Radioactive Waste Definitions

<sup>3</sup>Nuclear Waste Policy Act [42 U.S.C. § 10101](#)(12). The AEA and WIPP Land Withdrawal Act both incorporate this NWPA definition by reference. [42 U.S.C. § 2014](#)(dd); [Pub. L. No. 102-579](#), Sec. 2(10).

In turn, the ERA incorporates the AEA definition by reference. See [42 U.S.C. § 5814](#) note (“The following provisions of the Atomic Energy Act of 1954, as amended, generally apply . . . Chapter 2 [(section 11) 42 U.S.C. 2014] (‘Definitions’)”).

<sup>5</sup> The NWPA defines “spent nuclear fuel” as follows:

[F]uel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

[42 U.S.C. § 10101](#)(23). The AEA and WIPP Land Withdrawal Act incorporate this NWPA definition by reference. See [42 U.S.C. § 2014](#)(dd); [Pub. L. No. 102-579](#), Sec. 2(15).

<sup>6</sup> Code of Federal Regulations (CFR), Title 10 Part 61 ([10CFR 61](#))

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> [10 CFR § 61.55](#)

<sup>10</sup> Radionuclides are a class of chemicals where the nucleus of the atom is unstable.

<sup>11</sup> Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375).  
[https://www.energy.gov/sites/default/files/2016/02/f30/EIS-0375-FEIS\\_Summary-2016.pdf](https://www.energy.gov/sites/default/files/2016/02/f30/EIS-0375-FEIS_Summary-2016.pdf)

<sup>12</sup> DOE began using the term “GTCC-like” to describe West Valley TRU following the publication of this EIS. The definition of this West Valley waste as “transuranic waste” is established in statute (the West Valley Demonstration Project Act), and as such, must be followed by all parties.

<sup>13</sup> U.S. Government Accountability Office: Nuclear Waste: DOE Needs to Improve Transparency in Planning for Disposal of Certain Low-Level Waste. September 29, 2022 <https://www.gao.gov/assets/gao-22-105636.pdf>

<sup>14</sup> Executive Director for Operations L. Joseph Callan to NRC Commissioners, April 14, 1997. “Classification of Hanford Low-Activity Tank Waste Fraction as Incidental.” SECY-97-0083